Homework: Array two dimensions (matrix).

Exercise 1:

Write a program that transfers a two-dimensional array M of dimensions R and C (maximum dimensions: 10 rows and 10 columns) into a one-dimensional array V of size R * C.

Example:

$$\begin{pmatrix} a & b & c & d \\ e & f & g & h \\ i & j & k & l \end{pmatrix} \Rightarrow (a\ b\ c\ d\ e\ f\ g\ h\ i\ j\ k\ l)$$

Exercise 2:

Write a program that performs the transposition ${}^tA$ of a matrix A of dimensions N and M into a matrix of dimensions M and N.

1. The transposed matrix will be stored in a second matrix B which will then be displayed.
2. The matrix A will be transposed by permutation of the elements.

Recap:

$${}^tA = {}^t\begin{pmatrix} a & b & c & d \\ e & f & g & h \\ i & j & k & l \end{pmatrix} = \begin{pmatrix} a & e & i \\ b & f & j \\ c & g & k \\ d & h & l \end{pmatrix}$$

Exercise 3

Write a program that multiplies an A matrix by a real X.

Recap:

$$X \times \begin{pmatrix} a & b & c & d \\ e & f & g & h \\ i & j & k & l \end{pmatrix} = \begin{pmatrix} X \times a & X \times b & X \times c & X \times d \\ X \times e & X \times f & X \times g & X \times h \\ X \times i & X \times j & X \times k & X \times l \end{pmatrix}$$

1. The result of the multiplication will be memorized in a second matrix B which will then be displayed.

2. The elements of matrix A will be multiplied by X.

Exercise 4:

Write a program that performs the addition of two matrices A and B of the same dimensions N and M.

Recap:

$$\begin{pmatrix} a & b & c & d \\ e & f & g & h \\ i & j & k & l \end{pmatrix} + \begin{pmatrix} a' & b' & c' & d' \\ e' & f' & g' & h' \\ i' & j' & k' & l' \end{pmatrix} = \begin{pmatrix} a+a' & b+b' & c+c' & d+d' \\ e+e' & f+f' & g+g' & h+h' \\ i+i' & j+j' & k+k' & l+l' \end{pmatrix}$$

1. The result of the addition will be stored in a third matrix C which will then be displayed.
2. Matrix B is added to A.

Exercise 5

Write a program that builds the PASCAL triangle of degree N and stores it in a square matrix P of dimension N + 1.

Example: Pascal's triangle of degree 6:

N = 0	1						
N = 1	1	1					
N = 2	1	2	1				
N = 3	1	3	3	1			
N = 4	1	4	6	4	1		
N = 5	1	5	10	10	5	1	
N = 6	1	6	15	20	15	6	1

Method:

Calculate and display only the values up to the main diagonal (included). Limit the degree to enter by the user to 13. Construct the triangle line by line:

1. Initialize the first element and the element of the diagonal to 1.
2. Calculate the values between the initialized elements from left to right using the relation: $P_{i,j} = P_{i-1.j} + P_{i-1,j-1}$